FIVE TRENDS SHAPING THE FUTURE OF THE SMART CARD IC MARKET

The smart card is one of the great successes in the world of information technology. A smart card is a device embedded with an integrated circuit, or chip, which performs the functions of a microprocessor, memory, and an input/output interface. These are secure, portable storage devices used for several applications, especially security-related to access a system's database either online or offline. Smart card ICs help business development and expansion of their

products and services in a changing global marketplace. Smart card technology is used to provide data portability, security passports, and USB-based tokens.

The smart card IC market is segmented into memory and microcontroller-based smart card ICs. Key players in the smart card IC market, on the product development side, include Infineon Technologies AG, NXP Semiconductors, Samsung Electronics, STMicroelectronics, and CEC Huada Electronic Design Co. Ltd. These have been working on different strategies to drive sales using the most influential marketing techniques. However, as we examine the challenges and opportunities ahead in this market, companies can benefit from a strategy of developing smart cards with enhanced security such as Physical Unclonable Functions (PUFs) and the integration of smart cards with biometrics, along with their heterogeneous integration to drive toward the key target market trends we have identified. Lucintel predicts that the global smart card IC market will be valued at $3.7 billion by 2025, with an expected CAGR of 1% to 3% between 2020 and 2025.

Lucintel identifies five trends set to influence the global smart card IC market. Most of the industry players and experts agree that these five trends will accelerate developments in the smart card IC industry in the near future. In terms of the widespread knowledge about the smart card IC already on the horizon, there is still a lack of unified perspective on the direction the industry is moving to proactively address developments. To help bring more clarity to this gap, our study aims to provide insights concerning the direction that changes are taking and how these changes will impact the smart card IC market.

1. Development of Smart Cards with Enhanced Security

Smart cards are widely used in various applications ranging from banking and telecommunication to electronic passports, electronic IDs, anti-counterfeiting devices, smart grid, and many more. Security is the crucial factor in all applications. Physical Unclonable Functions (PUFs) provide a complete range of security protection in these applications. Physical Unclonable Functions (PUFs) are defined as functions based on physical characteristics, unique

to each chip, which are difficult to predict, easy to evaluate, and reliable. These provide a secure method for storing a key which can withstand today's security attacks, and even protect against potential future attacks. Two prominent examples of PUFs in smart card applications are arbiter PUFs and SRAM based PUFs. Arbiter PUFs rely on race signal conditions, and SRAM-based PUFs work with smart card ICs' internal memory. During the production or personalization of a smart card, the IC measures its PUF environment and stores this unique measurement. Then the IC can repeat the measurement and check if the environment has changed, which would indicate an alteration in the card body and also protect against many kinds of invasive attacks. SRAM PUFs can protect application keys or other critical user assets in a way that is more secure than just storing the key in Non-Volatile (NV) memory.

For instance, the use of PUF technology (the private key used in a passport) protects more strongly against (memory) reverse engineering attacks than standard methods. The document usually uses an authentication method based on a private key stored in NV memory. PUF technology can be used for added protection against future attacks. The e-ID also uses an electronic signature based on a private key. In mobile devices, a smart card IC equipped with data similar to that of a bank card works with a contactless interface to let the phone serve as a contactless payment card, meaning that threats and attacks exist similar to those for a standard payment card. PUF technology can be used to protect external memories from all kind of threats and attacks.

2. Integrating Smart Cards with Biometrics

Smart card technology integrated with biometrics adds a new level of security and convenience to credit and debit cards. In various organizations, smart cards are deployed to increase the security of their access control solutions while providing a pathway to other smart credential applications ranging from company cafeteria charges to checking out equipment. Biometric technologies, such as hand geometry, allow a facility manager to confirm that only verified users have access to a facility at authorized times. This technology provides the highest level of assurance that the actual authorized individual, rather than just the authorized key, card, or code, has access to a secure facility.

Biometric data can be stored on a smart card, in the local reader, or in a central database. For a smart card based ID system, the biometric template would typically be stored in the smart card. This results in increased privacy and portability for the user. It guarantees that the information is always with the cardholder, thus supporting matching without dependence on the availability of an online database connection, such as to get into the employee door of a hospital, for which a smart card on its own usually suffices. Entrance into the operating room, for example, is potentially dependent on an individual using a biometric. Access to the pharmacy, relies on an individual undertaking two-step verification, putting the smart card into a slot on the side of a hand geometry reader, and then having his/her hand geometry read and verified.

3. Modernization of Public Transport Systems

Rapid motorization and traffic congestion are the major challenges for large cities in the developing world, challenges which are generating significant economic and social costs. Single-passenger travel involves a confounding mix of cash, paper tickets, and electronic swipe cards. The different transit systems of buses, subways, and commuter trains in some cases operate independently of each other, resulting in the frustration of the riders, who have to juggle multiple fare cards and different methods of payment. In response to rider demand, many of the largest transit systems are modernizing their public transport system. Smart cards, in which smart card ICs have been deployed, play a key role in the modernization of public transportation systems.

The public transport sector is one of the fastest growing markets for smart card ICs. Various cities are upgrading and transforming their public transport systems to better serve the needs of their populations and the environment. Various governments are trying to provide one modern and easy-to-use payment system for all travel, including on-and-off-street parking and park-and-ride facilities. The smart card meets these needs in terms of convenience, efficiency, reliability, and cost, and also provides verifiable data for the accurate and transparent collection of fees and fares, as well as service provider reimbursements to the public and all transportation and parking service providers. There are two categories used for a public transport ticketing: single-purpose transit passes and an electronic purse (e-purse) card with various applications, such as small retail transactions and personal identification.

4. Increasing Focus of Government on E-Governance Projects

There have been considerable developments of Information and Communication Technology (ICT) systems regarding e-governance applications. By introducing e-governance services,

governments can significantly reduce transaction costs and improve internal planning mechanisms. Various technologies and applications can be used for e-Governance services, such as telephones, messaging, biometric identification, smart cards, RFID chips, and others. Television and radio based services are used to provide disaster warnings, electronic newsletters, education management

systems, and other services by governments. Identification fraud, non-identified criminals, terrorism, illegal immigration, and prohibited use of unprotected cards have prompted the need for more secure and reliable identification technology. Smart cards meet the basic need for a secure and authentic transaction in an e-governance environment.

The market for government identification is moving from physical security elements to the smart card of IDs and passports to voting cards and driving licenses. Digital identity solutions have the potential to improve national security, limit identity fraud, and enable more convenient, automated identification and authentication services for citizens. Various countries provide smart card e-Governance solutions such as Multi-National Identity Cards (MNIC)/Unique Identity Cards (UID), e-Passports and e-licenses, driving licenses/registration certificates (DLs/RCs), and more. Smart card based national ID cards are issued to identify authentic citizens of a particular country. Smart cards have multi-application functionality and a flexible nature, which means that national ID cards can to play an essential role in providing services for a targeted population.

Smart cards also have strong capabilities in terms of conceptualization, system design, and integration, and can help governments roll out customized ID applications. The e-passports contain a contactless chip, which is used to store biographic and biometric data and images. This data can then be instantly transferred in a contactless fashion to a passport-reading system.

5. Growing Number of Financial Fraud Cases

There are various risks associated with financial fraud, such as identity theft, vishing, SMSishing, viruses and trojans, spyware and adware, social engineering, website cloning, and cyberstalking. There are also a growing number of credit card fraud cases in the global market. When it comes to credit card fraud, the major development in the United States over the past few years has been the move from magnetic stripe readers to EMV smart chip authentication at payment terminals. The smart credit card has been designed to generate a new security code every hour to combat fraud. This new technology, called EMV, consists of cards with a microchip which works with new point-of-sale readers and scans the chip and process payment transactions in a secure manner using encryption. The chip reduces fraud, as it contains a cryptographic key to authenticate the card as a legitimate bank card, and also generates a one-time code with each transaction. Thieves can't simply take stolen account numbers and place them onto the magnetic strip of a random card, or program them onto the chip of a random chip card, to make fraudulent purchases at stores or unauthorized withdrawals at ATMs. This move to EMV technology has been used in the UK and Canada for years to great effect in reducing fraud. It provides direct benefits to consumers, merchants, banks, and others. Thus, smart card ICs have already been adopted in various countries, which allows for more secure payment processes and a more

efficient payment system.

Strategic Considerations for Key Players in the Smart Card IC Market

The smart card IC industry is dynamic and ever-changing. Successful industry players are masters of innovation, change and adaptation. To retain this status, they need to be attentive to current trends. We believe there will be promising opportunities for smart card ICs in telecommunication, payments and banking, transportation, e-government, and others. As per Lucintel's latest market research report (Source: https://www.lucintel.com/smart-card-ic-market.aspx), the smart card IC market is expected to grow with a CAGR of 1% to 3% between 2020 and 2025, and reach $3.7 billion by 2025. This market is primarily driven by the increasing usage of Subscriber Identification Module (SIM) cards for mobile phones, growing adoption of electronic identification cards for various e-governance projects, and an increasing usage of smart cards in the payment and banking industries.

Trends and Forecast for the Global Smart Card IC Market (US $B) (2014-2025)

Source: Lucintel
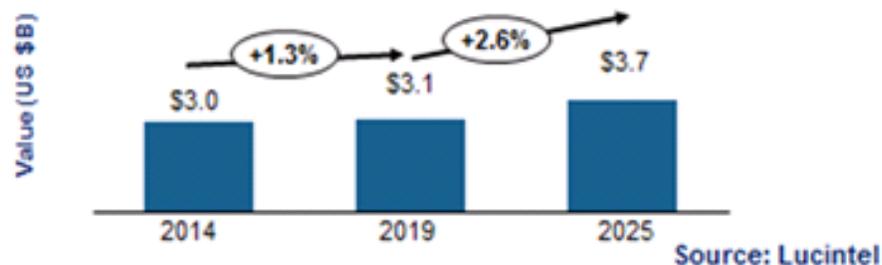
Whether you are new to the smart card IC market or an experienced player, it is important to understand the trends that impact the development process, as these trends as listed above will

lead players to create long-term strategy formulation that will allow them to remain competitive and successful in the long run. For example, to capture growth momentum, smart card IC market players can develop capabilities in smart cards with enhanced security such as Physical Unclonable Functions (PUFs), which provides a complete range of security protection. Players can also focus on smart cards integrated with biometrics, a development which is expected to lead future trends.

Note: In order to gain better understanding, and learn more about the scope, benefits, and companies researched, as well as other details in the smart card IC market report from Lucintel, click on https://www.lucintel.com/smart-card-ic-market.aspx. This comprehensive report provides you in-depth analysis on market trends and forecast, segment analysis, regional analysis, competitive benchmarking and company profiling of key players. In addition, we also offer **strategic growth consulting** to meet your customized needs. We have worked with many PE firms and corporate customers in the process of their market entry and M & A initiatives.

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